

Substitute Specification (Without Markings)

**Caption MP3 Player**

**CROSS REFERENCE TO RELATED APPLICATION(S)**

5 This application claims priority to international application number  
WO/2000/41175 filed under the patent cooperation treaty, which claims priority to  
Korean Patent Application No. 199/235, filed on January 8, 1999, which are hereby  
incorporated herein by reference.

**BACKGROUND OF THE INVENTION**

**[Field of the Invention]**

10 The present invention relates to a caption MP3 player having a caption display  
function, caption MP3 data format and method of reproducing caption MP3 data and in  
particular, to a caption MP3 player having a function of displaying caption information on  
a display device in synchronism with corresponding audio information while outputting  
the audio information on stereo, a caption MP3 data format and a method of reproducing  
15 the caption MP3 data.

**[Description of the Related Art]**

Generally, MP3 means MPEG (Motion Picture Expert Group) Layer-3, and  
belongs to the audio technology in the MPEG field. MP3 is an audio file format that is  
formed by compressing existing data by audio data coding without deterioration in sound  
20 quality. Such an MP3 file has an AAU (hereinafter, "audio decoding unit") recording  
format. In other words, the MP3 file comprises a header, cyclic redundancy check (CRQ,  
audio information, and auxiliary data. Usually, the MP3 player playing MP3 files is used  
as a dedicated audio appliance for receiving compressed audio files and reproducing them  
in the form of audio information.

The conventional MP3 player mounts a liquid crystal display on which, in addition to the audio information, simple character data (e.g., a simple reference such as a title of a song) is displayed. However, such character data cannot synchronously display a character, i.e., the caption information, which corresponds to the audio information.

5           In the conventional caption tape type using a cassette tape, the caption information and the audio information are stored on two tracks of the tape, respectively, that is used exclusively for audio. The audio information and the caption information are outputted to the speaker and liquid crystal display, respectively, by the caption cassette player.

10           However, the caption tape type, in which the digital signal of the character data is converted into an analog signal and stored on the tape, has some problems when reproducing the data. The problems are that: the character signal results in noises by interrupting the audio signal; the audio signal results in an error in the character by interrupting the character signal; or the audio information is outputted on mono, not stereo, by storing the character data in one of the tracks on the tape.

15           To solve the problem of mono output in the caption cassette, the tape is divided into four tracks or output is achieved in the stereophonic mode by signal synthesis. However, when four tracks are used, the player should comprise a four-track head to process the data on each track. When the data is outputted in the stereophonic mode by the signal synthesis, signal loss may occur during the analysis of the signal since it is not  
20           possible to completely divide the synthesized signals. Moreover, both signals result in noises by interrupting each other when reproducing the audio information

## **SUMMARY OF THE INVENTION**

25           An object of the present invention is to provide an MP3 player having a caption information display function of storing audio information and corresponding caption information in an MP3 recording medium and reproducing the recorded data by

synchronizing the data with each other, and provide an MP3 data format and a method of reproducing the MP3 data.

5 An MP3 file according to the present application comprises standard MP3 audio information and caption information having data to display the audio information in the form of characters, and thus is referred to hereinafter as caption MP3 data or caption MP3 file.

10 In the reproduction of the caption MP3 file, the audio information to be reproduced and the corresponding caption information should be synchronously outputted. For the synchronization of the audio information and the caption information, position data and time data can be used. Both or only one of the position data and the time data can be used. The position data may be that of the audio information that should be synchronized with the caption information or that of the caption information that should be synchronized with the audio information. The time data is to indicate the display time of the caption data that should be outputted through a display device.

15 The caption MP3 player according to the present invention reproduces the caption MP3 data comprising audio information and corresponding caption information (the caption information including position data and/or time data), the audio information having a standard MP3 file format comprising a header, audio data and auxiliary data, the caption MP3 player comprising: a storage means for storing the audio information and the  
20 corresponding caption information inputted thereto; a signal separating means for separating the audio information and caption information inputted from the storage means; a control means for controlling the storage and output of the information through the storage means and controlling the audio signal and the corresponding caption signal, which are separated by the signal separating means, to be synchronized; a caption output  
25 means for outputting the caption signal synchronized with the audio signal, which corresponds to the caption signal and is outputted from the audio output means, by inputting the output from the signal separating means, The caption MP3 data format

according to a first embodiment of the present invention comprises an audio information and a corresponding caption information, the audio information having a standard MP3 file format with a header, audio data and auxiliary data, wherein the caption information includes position data and/or time data, and when the audio information is reproduced, the caption information synchronized with the reproduced audio information is outputted using the position data and/or the time data.

The caption MP3 data format according to a second embodiment of the present invention has a format comprising a plurality of caption MP3 files, each of the caption MP3 files having audio information and corresponding caption information, the audio information having a standard MP3 file format with a header, audio data and auxiliary data; wherein the audio information is located before the caption information in the each MP3 file, and the caption information includes caption display time data showing the time indicated in a display device when the caption information is reproduced.

According to the present invention, the caption information can be included in the standard MP3 information, in which the audio information is stored, and the caption information can be provided along with the audio information by synchronously outputting the caption information with the audio information using the position data and/or time data.

The present invention has an advantage in that there is no noise by the intervention between the caption information and the audio information since they are separated. The present invention has an advantage in that the caption information is stored in the form of a digital signal so that the caption information can be stored in various formats such as an image, hypertext, text, etc. and that the deterioration in sound quality by repeated reproduction is prevented.

Further, there is an advantage in that the file format, in which the audio and the caption are synchronized, makes searching and movement between intervals faster and

easier.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

5 The drawings referenced herein form a part of the specification. Features shown in the drawing are meant as illustrative of only some embodiments of the invention, and not of all embodiments of the invention unless otherwise explicitly indicated. Implications to the contrary are otherwise not to be made.

FIG. 1 is a block diagram of a caption MP3 player format according to the present invention.

10 FIG. 2 is a view illustrating a caption MP3 data format according to the first embodiment of the present invention.

FIG. 3 is a flow chart showing a caption MP3 data reproduction method according to the first embodiment of the present invention.

15 FIG. 4 is a view illustrating the caption MP3 data format according to the second embodiment of the present invention.

FIG. 5 is a flow chart showing the method of reproducing caption information in the caption MP3 data according to the second embodiment of the present invention.

### **20 DETAILED DESCRIPTION OF THE INVENTION**

The construction and operation of the present invention will be explained in detail with reference to the accompanying drawings.

FIG. I is a block diagram of an MP3 player having a caption display function according to the present invention. The caption MP3 player according to the present invention comprises an input section (11), storage section (12) for storing audio information and/or caption information, signal separation section (13) for separating the audio information and the caption information, control section (10), audio output section (16), caption output section (14) and display section (15).

The audio information and the caption information are inputted through the input section (11) from a recording medium (18) in which caption MP3 files are recorded. The input section (11) is preferably an electric circuit comprising a connection port. The audio information and the caption information inputted through the input section (11) are stored in the storage section (12), preferably a memory cell. The signal separation section (13) separates the audio information and the caption information stored in the storage section (12).

The control section (10) controls the storage of information in the storage section (12) or the output of information from the storage section (12), and synchronizes audio signals and caption signals that are separated in the signal separation section (13). Also, the control section (10) counts playing time while the audio information is being reproduced.

The control section (10) is preferably a microcomputer having function of processing signals or a control circuit comprising a microcomputer, and is formed to be controlled by a user.

The audio output section (16) receives the audio signal corresponding to the audio information among the information from the signal separation section (13) and sends the signal to a left speaker (L SPK) and a right speaker (R SPK) so that the signal is outputted as an audio signal that can be heard. The caption output section (14) outputs the caption signal corresponding to the caption information among the information from the signal

separation section (13) in synchronism with the audio signal outputted from the audio output section (16).

5 The display section (15) displays the caption corresponding to the caption signal outputted from the caption output section (14) in a visible form on the screen. Preferably, the display section is a liquid crystal display (LCD).

10 In the caption MP3 player of the present invention having such a construction as described above, when the audio information and the caption information are inputted through the input section (11) from the caption MP3 file recorded in the recording medium (18), the audio information and the caption information are stored in the storage section (12) through the control of the control section (10). Each information stored in the storage section (12) is outputted from the storage section (12) through the control section (10) controlled by the user when the output of information is required. The outputted information is separated into audio information and caption information through the signal separation section (13), and the separated audio signal is outputted to the speaker in the monophonic or stereophonic mode through the audio output section (16). The separated caption signal is synchronized with the audio signal and outputted on the display section (15) through the caption output section (14).

#### First Embodiment

20 A caption MP3 data format according to the first embodiment of the present invention will be described.

FIG. 2 is a view showing a caption MP3 data format according to an embodiment of the present invention. The caption MP3 information according to the present invention consists of audio information (20) and caption information (22). The audio information has a standard MP3 file format with a header, CRC, audio data and auxiliary data. The header is located on a fixed field of 32-bits and in that field, information, such as a layer,

sampling frequency and remaining frame, is contained. As an option, the existence or nonexistence of CRC depends on the header. Audio data is compressed data, and the length of data depends on the kind of the data. The auxiliary data, as a user definition area, includes additional information and is variable in dimension.

5           Each caption information (22) comprises a start synchronization code (1), reproduction number data (2) and information data (8). It is not necessary to arrange these elements in the order as shown in FIG. 2. The arrangement shown in FIG. 2 is just an example for description.

10           The start synchronization code (1) of the caption information (22) means the beginning of the caption information. The reproduction number data (2) is located after the start synchronization code (1) and indicates the number for indicating to which audio information frame among a plurality of pieces of audio information (20) the caption information corresponds. It can be understood that the reproduction number is the position data of the audio information with which the caption information should be  
15           synchronized or the position data of the caption information with which the audio data should be synchronized.

          The reproduction number data indicates the number, which is used for reference when the audio information (20) and the caption information (22) are reproduced, and is formed with a size of 4-bits, for example.

20           The information data (8) include the related information such as the address of data or the kind of data to be stored and also includes, for example, reproduction address data (3), information identification code (4), selection code (5) and caption data (6).

          The reproduction address data (3) shows the reproduction number, by which the caption information is combined with each other when a plurality of pieces of caption  
25           information are in the form of one word or picture, and is formed with a size of 4-bits, for



example. To form a paragraph of large amount, at least one or more pieces of the caption information are required. The information identification code (4) shows of what type a stored information file is. The file can be in the form of an image file, hypertext file (HTML) or text file, for example, which is adapted for the display device.

5           The selection code (5) indicates at least one of the language form used in the stored information, operation time and display mode of the display section (15). The form of the used language can be, for example, Korean (KOR), Japanese (JP), English (USA), etc., and the operation time is the time at which the caption information should be outputted. By using the operation time, the caption information is synchronized with the  
10       audio information.

          The display mode shows whether the caption in the form of a word or sentence is outputted on the display section (15) in sequence or at once, and determines in what form (for example, columns and 4 lines or 24 columns and 2 lines) the characters should be displayed.

15           By using the operation time of the selection code (5), it is possible to output the caption information in synchronism with the audio information. For such synchronization, the operation time data and the reproduction number data (2) can be used together or separately.

          The caption data (6) shows the caption character outputted from the MP3  
20       recording medium. The character stored at this time can be, for example, in the form of an image, hypertext, text, etc. When a caption information group (22a) comprising a plurality of pieces of caption information (22) formed as such is added to an W3 data format (20a) comprising several pieces of audio information (20) of an audio decoding unit and is outputted from the recording medium in which the MP3 audio information  
25       (20) is stored, the caption character is outputted in synchronism with each audio signal extracted from a plurality of pieces of audio information (20). The MP3 data group (20a)

forms one MP3 file that for example, corresponds to a song. The caption data group (22a) includes the contents of caption corresponding to one MP3 data format (20a), and each of a plurality of pieces of caption information (22) corresponds to one word or sentence that forms the contents of the caption.

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The recording medium comprises an optical recording apparatus such as a compact disc, audio tape, magnetic recording apparatus, such as a hard disc, and memory.

A plurality of pieces of audio information (20) included in the MP3 audio information (20a) each has a 32-bit header and 16-bit CRC, audio data and additional data.

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Reproduction of the information having such a caption MP3 data format will be explained with reference to the flow chart of FIG. 3.

The recording medium is inserted into an apparatus reproducing the signal stored in the recording medium, e.g., the MP3 player shown in FIG. 1, and the stored information is reproduced by the control of the control circuit including a microcomputer of the reproducing apparatus.

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At least one of the audio information (20) and the caption information (22) is stored in the MP3 recording medium (step 30) so that the synchronized audio signal and the caption signal are outputted for reproduction. The control circuit determines whether the audio information (20) only exists in the information stored in the recording medium (step 32).

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At the determining step (32), when it is determined that the audio information (20) exists in the recording medium without the caption information (22), the audio information (20) only is outputted from the recording medium (step 34) because the

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caption information (22) is not outputted and thus does not exist.

5 However, when it is determined that the caption information (22) exists in the recording medium, the caption signal and the audio signal are reproduced in synchronism with the caption information according to the existence and/or non- existence of the audio information (20) in the recording medium, and then the reproduction of the next caption signal or audio signal is repeated (steps 36-48).

10 As a first determining step, to reproduce all of the desired caption information and the audio information during the above repetition, it should be determined first whether the caption information (22) and the audio information (20) exist together in the recording medium (step 36).

At the first step (36), if it is determined that the caption information (22) exists without the audio information (20), the caption information (22) only is outputted (step 38).

15 In the meantime, the caption information (22) exists in the first step (36) together with the audio information (22), the compressed audio information (20) is decoded for reproduction (step 40).

20 As a second determining step, it is determined whether the caption information (22) corresponding to the audio information (20), which is decoded at the decoding step (40) so that when the reproduction apparatus outputs an audio, a corresponding caption can be outputted (step 42). If there is no corresponding caption information, output of information is maintained by continuously outputting the already outputted caption information or a caption information having a blank character (step 44).

However, if there is caption information (22) corresponding to the audio information (20), the caption information is decoded according to the file form of the caption information, for example, image, hypertext, text, etc (step 46).

5 Then, the caption information is synchronized with the corresponding audio information, which is decoded at the decoding step (40), in the reproduction apparatus and outputted (step 48), and the first determining step (36) returns to output the next caption information.

10 For example, by the caption information (22) added to the audio information (20), the sound “beau-” and the character “beau-” synchronized with the sound “beau-” are outputted from the respective output apparatuses, i.e., the speaker from which the audio information (20) is outputted and the display device from which the caption information (22) is concurrently outputted. At this time, since the audio information (20) and the caption information (22) have a capacity capable of storing at least a part of the audio signal and the caption signal, which are to be “beau-,” the audio information (20) and the  
15 corresponding caption information (22) are required to store words such as “beautiful”.

In this manner, the audio information (20) stored in the caption MP3 recording medium and the caption information (22) synchronized to correspond to the audio information are simultaneously reproduced as audio and caption through the respective output apparatuses.

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### Second Embodiment

As shown in FIG. 4, an MP3 data format (50) according to a second embodiment of the present invention comprises a plurality of caption MP3 files (50a, 50b,...). Each caption MP3 file has audio information (52) and caption information (54). The audio information (52) comprises standard MPEG audio files as that in the first embodiment.

In FIG. 4, the caption information (54) comes after the audio information (52). In a different way, the caption information (54) could come before the audio information (52).

5           However, when considering the wide utility of software for MP3 file reproduction, it is preferable to use the structure shown in FIG. 4.

In FIG. 4, one MP3 file (e.g., 50a) appears to comprise one audio information (52a) and one caption information (54a). However, that is just for simplification of the drawing.

10           One skilled in the art could understand that substantially in the most caption MP3 files, one file comprises a plurality of pieces of audio information and a plurality of pieces of corresponding caption information. One MP3 file corresponds to one paragraph of phonetic information that is divided, for example, by a tune of song and a predetermined basis (e.g., theme).

15           Each of the caption information 1 and 2 (54a and 54b) comprises a caption start synchronization signal (56), caption data 1, 2,..., N (58a, 58b,..., 58n), text type (67) and caption identification code (62). The caption start synchronization signal (56), for example, as 4-byte data, indicates the start position in which the caption information is contained. The caption data (58) contains the character information to be displayed on the  
20           real screen and its size changes according to the character information. The caption data (58) will be explained hereinafter.

          Text type (60) determines the type, i.e., form of text output so that for example, the character information in the caption data (58) is outputted, being formed into 20 columns and 4 lines or 24 columns and 2 lines. The caption identification code (62) is a  
25           code that identifies whether the data format is the caption MP3 file. Each of the caption data 1, 2,..., N (58a, 58b,..., 58n) is formed to include a caption display time (64),

sentence start identification (66), caption (68), additional data (70), option (72) and the size of data (74).

5       The caption display time (64) as the time data of a point of time to display the caption is sized, for example, to be 7 bytes. The sentence start identification (66) is a code to find the beginning of the sentence when the sentence is displayed on different screens.

10       The caption (68) is character data to be displayed on the screen, and the additional data (70) is used when an information except the option is required and contains the information that shows the form of the caption information file (image file, hypertext file, text file) or indicates the language of the caption information. The option (72) is a storage place for so-called optional matters that stores the information such as a scroll form (e.g., the character is displayed, flowing on the screen, or a previous sentence disappears slowly and the next sentence appears slowly on the same place) or a flash (e.g., flickering of letters). Into the data size (74), information on the length of the caption data is inputted.

15       In the caption MP3 file of such an information format, the audio information and the caption information are synchronized with each other by the caption display time (64) data.

      The synchronization by the use of time information is more advantageous than that by the use of the position data and has a lower rate of failure.

20       In the meantime, as described above, the standard MP3 file has a format comprising a header, a CRC, audio data and additional data. It can be considered that the caption information is included in the additional data of the standard MP3 file. However, since the compression rate varies depending on the amount of the audio data, it is therefore easier to add the caption information as a separate file format as in the first and second embodiments according to the present invention than to include the caption  
25       information in the additional data. Further, there are many advantages such as the

prevention of noise by the interruption occurring between the caption information and the audio information.

FIG. 5 is a flow chart showing the method of reproducing the caption information in the caption MP3 file according to the second embodiment of the present invention.

5           The file stored in the recording medium is opened; it is identified using the caption identification code (62) of the caption information (54) whether the caption information is in the file to be reproduced; the caption information is stored in the storage section (12) of the caption MP3 player if the caption information is included in the file and then the caption information is reproduced. When the reproduction of the caption  
10           information initiates, the caption information is initialized (step 80). At the step of initializing the caption information (80), it is determined whether to delete the caption displayed on the display device and to which file the caption data is attached. The reproduction terminates at the termination step (85). Otherwise, the playing time, which is reproduced in units of 1/1000 sec., is brought (step 86). This playing time has a value  
15           counted by the reproduction apparatus, for example, the control section (10) of the caption MP3 player shown in FIG. 1. The playing time is compared with the caption time (step 88). The caption time, as a caption display time (64a) of the caption data (58), is the time data value of a point of time at which the caption is displayed. The next caption time data is brought (step 90) and then the caption information is outputted (step 92). After  
20           returning to the termination-of- reproduction determining step 84 (step 94), steps 86-92 are repeated.

          Although the present invention has been described with reference to the drawings, it is understood that this description is not to limit the invention to the embodiments  
25           shown in the drawings but simply to explain the invention. One skilled in the art will understand that various changes and modifications can be made from the embodiments disclosed in the specification. Therefore, the scope of the present invention should be

defined by the appended claims.